out any corresponding expenditure; or we could theoretically have a means of perpetually obtaining mechanical work out of nothing, unless it were the case that greater cold is required to freeze water into ice on the stressed crystal than on a crystal free from stress. Hence we must suppose that a greater degree of cold will be required to cause the stressed crystal to grow. The reasoning just given has been for brevity stated somewhat in outline; but I trust the full meaning can readily be made out, and that what has been said may suffice.

I wish now to suggest as an important subject for investigation, The Effect of Change of Pressure (hydraulic pressure) in changing the Crystallizing Temperatures of Saline or other Solutions of given Strengths,—as I feel sure that such effect must exist, but am not aware that it has been hitherto discussed or experimented on, and as it is intimately connected with the matters under consideration in the present paper and with subjects discussed in previous papers, which I have submitted to the Royal Society, on Ice.

II. "Determination of the Magnetic Declination, Dip, and Force, at the Fiji Islands, in 1860 and 1861." By Colonel WILLIAM JAMES SMYTHE, of the Royal Artillery. Communicated by General SABINE, P.R.S. Received October 23, 1861.

[Note by the Communicator.—Colonel Smythe is known to magneticians as having been Director of the Magnetic Observatory at St. Helena from 1842 to 1847. Being about to proceed, in December 1859, on a Government Mission to the Fiji Islands, which would require his residence there for some months, he addressed a letter to the Council of the Royal Society expressing his readiness to make any scientific observations that might be suggested to him as likely to be useful in a part of the globe hitherto so little known. The Council directed that the Committee of the Kew Observatory should be informed of the opportunity thus offered of obtaining a reliable determination of the present values of the magnetic elements at the Fiji Islands; and Colonel Smythe was in consequence supplied with the necessary instruments from that establishment.

In communicating to the Society this paper, containing the results

of Colonel Smythe's observations, Major-General Sabine is desirous of drawing the attention of the Fellows to the thoroughly business-like manner in which Colonel Smythe has performed this useful service and to the illustration which it affords of the advantages anticipated by M. Gauss from the establishment of the British Colonial Magnetic Observatories—that "they would become schools for many good observers who would subsequently extend their activity over a wider range, and would contribute to arouse, to nourish, and to extend to other parts of natural knowledge that desire for the greatest possible accuracy in observation which was formerly met with only in Astronomy and in the higher Geodesy." (Letter to Sir John Herschel printed in the Reports of the British Association for the Advancement of Science for 1845, p. 45.)]

The accompanying observations were taken at a wooden house erected for the purpose on a clay soil 106 feet above the mean level of the sea, and distant 265 yards West (19° 07′ S.) from the spot on the beach where I have been informed Captain Denham's observations were made. The latter spot is on volcanic rock thinly covered with sand and grass, close to the base of the low rocky promontory on which Commodore Wilkes, U.S.N., set up his Observatory.

Declination.—The values of this element, deduced from A.M. and P.M. observations of the sun's azimuth, differ by about 10′. As the several determinations in each position agree very well, the difference is treated as instrumental error, and the mean of the two results taken as the true value of the Declination.

Inclination.—The individual readings of the needles in the various positions differed considerably. The means, however, accord.

Intensity of the Force.—By comparison of the time of vibration in December 1860 and April 1861, the suspended magnet is perceived to have lost force. During the interval, it remained in its box perfectly undisturbed. The value of $\pi^2 K$ used in all the calculations is the same, as there was no means of ascertaining its temperature corrections. It was deduced from a series of vibrations with and without the gun-metal cylinder No. 6, in December 1860, after the conclusion of the observations for Intensity. The correction $1-\frac{P}{r^2_0}$ has not been applied.

Magnetic Declination.

Levuka, Fiji Islands. Lat. 17° 41′ S. Long. 178° 52′ E.

	Date.				⊙ Altitude corrected.	⊙ True Azimuth.	⊙ Azimuth by Compass.	Magnetic Declination.	
			d	h	m	° ′ ″	° ′	° ′	
A.M. Observations. 1860.		Dec.	18	19	15	23 54 19	108 22	98 56	9 26 E.
			20	19	00	21 10 04	108 56	99 32	9 24
			20	19	30	27 52 28	107 42	98 16	9 26
			23	19	00	21 27 19	108 52	99 29	9 23
			25	19	15	24 06 41	108 17	98 52	9 25
			26	19	10	22 57 16	108 28	99 04	9 24
			27	18	45	17 33 18	109 33	100 06	9 27
P.M. Observations. 1861.		Jan.	18	04	55	23 13 03	105 17	114 33	9 16 E.
			18	05	05	20 20 33	105 56	115 12	9 16
			24	05	05	20 07 11	104 31	113 46	9 15
			25	05	00	21 29 21	103 57	113 12	9 15
			25	05	10	19 52 36	104 19	113 35	9 16
		Feb.	18	04	40	24 47 42	94 55	104 10	9 15
			18	04	55	22 35 02	95 32	104 47	9 15

9° 25′·0 (A.M.) 9° 15′·4 (P.M.)

Mean Magnetic Declination 9° 20′·2 E.

Magnetic Inclination. Levuka, Fiji Islands. Lat. 17° 41′ S. Long. 178° 52 E.

Date.	Needle.	Azimuth.	Poles direct.	Poles reversed.	Mean.	Dip deduced.
1861. Hours.						
Jan. 7 21–23	No. 1	Magnetic meridian.	36° 13′·44	35° 50′·25	36° 01′·8	36° 01′·80
8 22–24	,,	,,	36 09·25	35 51·25	36 00·25	36 00·25
13 22–24	,,	,,	36 11·40	35 45·60	35 58·50	35 58·50
22 2–4	,,	,,	36 07·00	35 44·25	35 55·62	35 55·62*
23 22–24	,,	,,	36 14·00	35 49·81	36 01·90	36 01·90
Mar. 17 20–24	,,	,,	36 17·40	35 36·56	35 57·00	35 57·00
19 22h to 20 01	,,	45° E. of Magnetic meridian	46 11·81	45 36·31	45 54·06	36 06·83
	,,	at right angles to this position.	46 11·69	45 35·31	45 53·50	
21 22 to 22 01	,,	70° E. of Magnetic meridian	65 06·62	64 29·62	64 48·12	36 02·43
	,,	at right angles to this position.	38 04·19	37 26·40	37 45·30	
Apr. 2 22 to 3 01	,,	45° W. of Magnetic meridian	46 28·44	45 57·69	46 13·06	35 59·48
	,,	at right angles to this position.	45 36·62	45 04·75	45 20·68	
3 22–24	,,	Magnetic meridian.	36 15·62	35 43·94	35 59·78	35 59·78

Mean Magnetic Inclination by Needle No. 1 = 36° 00′·36

Jan.	8	c–01	No. 2	Magnetic meridian.	36 10·90	35 48·30	35 59·60	35 59·60
	9	22–24	,,	,,	36 14·12	35 50·44	36 02·28	36 02·28
	14	22–24	,,	,,	36 13·25	35 45·75	35 59·50	35 59·50
	21	22–24	,,	,,	36 15·06	35 45·44	36 00·25	36 00·25
	24	22–24	,,	,,	36 13·90	35 51·00	36 02·40	36 02·40
Mar.	18	22–24	,,	,,	36 17·75	35 42·75	36 00·25	36 00·25
	20	22h to	,,	45° E. of Magnetic meridian	46 04·75	45 23·00	45 43·87	35 56·89
	21	01	,,	at right angles to this position.	45 58·06	45 27·50	45 42·80	
	22	21–24	,,	70° E. of Magnetic meridian	64 50·31	64 12·75	64 31·53	36 01·01
			,,	at right angles to this position.	38 00·00	37 32·94	37 46·47	
Apr.	1	21–24	,,	45° W. of Magnetic meridian	46 16·00	45 50·94	46 03·47	35 58·56
			,,	at right angles to this position.	45 46·31	45 07·87	45 27·09	
	5	2–4	,,	Magnetic meridian.	36 15·75	35 50·44	36 03·09	36 03·09

Mean Magnetic Inclination by Needle No. 2 = 36° 00′·38

* This result was so much below the average that the observations were repeated, but without causing any change.

The Inclination is deduced from the observations made *out* of the Magnetic meridian by the formula $\cot^2\theta = \cot^2\eta + \cot^2\eta^1$.

Intensity of the Magnetic Force. Levuka, Fiji Islands. Lat. 17° 41 S. Long. 178° 52′ E.

Hozizontal Component { Magnet III., deflecting. Magnet S. III., suspended. / Temperature = 20°.

Date.	r_0.	u_0.	$\log \frac{m'}{X'}$.	$\log \frac{T^2}{}$.	$\pi^2 K$.	mX.	X.
	foot	° ′ ″					
1860. Dec. 8	1·0	6 36 32·5	8·76491	1·14513	1·67532	0·53019	7·6320
8	1·3	3 00 27·5	8·76548	,,	,,	,,	7·6270
11	1·0	6 37 02·5	8·76552	1·14607	,,	0·52925	7·6184
11	1·3	3 00 17·5	8·76515	,,	,,	,,	7·6217
12	1·0	6 36 50·0	8·76504	1·14655	,,	0·52877	7·6184
12	1·3	3 00 25·0	8·76511	1·14657	,,	0·52875	7·6177
1861. Apr. 16	1·0	6 20 18·75	8·74666	1·16709	,,	0·50823	7·5994
16	1·3	2 52 48·75	8·74632	,,	,,	,,	7·6024
17	1·0	6 19 31·25	8·74517	1·16674	,,	0·50858	7·6155
17	1·3	2 52 38·75	8·74553	,,	,,	,,	7·6124
18	1·0	6 19 46·25	8·74569	1·16680	,,	0·50852	7·6105
18	1·3	2 52 36·25	8·74534	,,	,,	,,	7·6128
19	1·0	6 19 00·	8·74497	1·16650	,,	0·50882	7·6194
19	1·3	2 52 22·5	8·74519	,,	,,	,,	7·6175
						Mean X=	7·6161

Total Magnetic Force = Horizontal Component × sec. Inclination = 7·6161 × sec. 36° 00′·37 = 9·4147.